# INTERNET COMMUNICATION OF PARKING LOT OCCUPANCY INFORMATION

This application claims the benefit of U.S. Provisional Application No. 60/156,391, filed September 28, 1999.

## TECHNICAL FIELD

The present invention relates generally to Internet communication. More particularly, the present invention relates to Internet communication of parking lot occupancy data.

## BACKGROUND

Locating a vacant parking space is often an ordeal that causes frustration for many commuters. Even where a commuter pays to enter a parking lot, valuable time is consumed searching for a parking space within the parking lot. It seems that parking lots that service hospitals, airports, mass transmit stations, entertainment forums, shopping malls and the like are always the most crowded, when time is the most crucial. As urban and suburban regions become more populated, finding a vacant parking space will become increasingly more difficult for commuters.

Several prior art devices have attempted to facilitate locating a parking space. In particular, U.S. Patent No. 5,293,163 to Kakihara et al. ('163 patent) discloses a system for locating garages with available parking spaces. According to the '163 patent, the location of a parking garage having available parking is displayed in map format.

U.S. Patent No. 5,432,508 to Jackson ('508 patent) discloses a technique for informing vehicle operators of available parking spaces in a parking garage. According to the '508 patent, light sources mounted above the parking spaces and at the entrance to the parking garage are used to indicate the location of available spaces. The '508 patent also discloses a computer which collects information concerning parking availability and communicates the information to prospective users. Namely, a person can call in to the computer through telephone and receive a voice message indicating whether the parking lot is full or not.
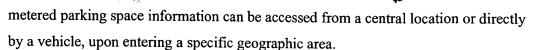
U.S. Patent No. 5,910,782 to Schmitt et al. ('782 patent) discloses a system for finding available on-street parking using an on-board vehicle navigation system and parking meters equipped with sensing devices. According to the '782 patent, real time

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metered parking space information can be accessed from a central location or directly by a vehicle, upon entering a specific geographic area.

U.S. Patent No. 5,940,481 to Zeitman discloses a parking management control system used to report parking, monitor parking and reserve parking spaces. According to the '481 patent, a user reports parking in a particular parking facility to a central control unit using a personal non-dedicated mobile communications device. The central control unit then confirms whether parking in the particular parking facility is authorized or not. The central control unit also generates a report indicating which parking facilities are supposed to be vacant for law enforcement officials so that unauthorized parking can be ticketed. The '481 patent also discloses that a user can reserve a desired parking facility by selecting a desired parking facility from a map provided from the central control unit. The next time a potential user, other than the registered user, wishes to park in the reserved parking facility and communicates with the central control unit, the potential user receives a message that the parking facility is already reserved and not authorized for use.

At present, however, no prior art device utilizes the capabilities of the Internet to display a real-time representation of a parking lot indicating vacant parking spaces.

## SUMMARY

According to the present invention, a server transmits parking lot occupancy information over the Internet. Such parking lot occupancy information is capable of being reproduced by a remote display device as a real-time representation of the parking lot indicating vacant parking spaces. The real-time representation may be in the form of a textual listing, a graphical map, a video image, an Internet Web page or similar form. When presented with the real-time representation of the parking lot, a commuter can readily locate an available parking space or decide to search for parking elsewhere.

## DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a communication network.

Fig. 2 is an expansion of the block diagram of Fig. 1.

Fig. 3 is a flow chart of a communications method.

Fig. 4 is a flow chart of a communications method.

Fig. 5 is a graphical user interface.

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## DETAILED DESCRIPTION

Fig. 1 illustrates a communication network 10 according to one embodiment of the present invention. The communication network includes a controller 11 for commanding a server 12 to transmit parking lot occupancy data corresponding to one

5 or more parking lots 13, 14 through the Internet 15. For simplicity, only the basic components of the communication network 10 are shown. However, as would be understood by one of ordinary skill in the art, the communication network may include various other components and structures in actual implementation. For instance, although a first parking lot 13 and a second parking lot 14 are shown, the

10 communication network may include only one parking lot or numerous parking lots.

The server 12 may be any type computer, computer system, server, settop box or other type of Internet accessible device and may include any type of hardware, software, application or program capable of functioning as described herein.

As indicated by the broken lines, the controller 11 may be either internal or

15 external to the server 12. An example a controller 11 is a software application loaded on the server 12 for commanding and directing communications enabled by the server 12. Other examples include a program, a piece of code, an instruction, a device, a computer, a computer system, or a combination thereof, for independently or collectively instructing the server 12 to interact and operate as described herein. The

20 controller 11 may be embodied permanently or temporarily in any type of machine, component, equipment, The controller 11 transmits commands to the server through a first connection 17, which may be any communication path capable of carrying commands between the controller 11 and the server 12.

As shown in Fig. 1, the server 12 is connected to the first parking lot 13

25 through a second connection 18. The second connection may be a serial, modem, telephone, cable, satellite, LAN (Local Area Network) including one or more other computers (not shown) or any other connection capable of carrying data between the first parking lot 13 and the server 12. The server 12 is also connected to the second parking lot 14 through the Internet 15 through a third connection 19 and a fourth

30 connection 20. The third connection 19 and the fourth connection 20 may be any type of modem, cable, satellite or other type of connection capable of carrying data through the Internet 15 between the second parking lot 14 and the server 12. Each of the third connection 19 and fourth connection 20 may also include one or more

intermediary computer systems or servers (not shown), such as an ISP (Internet Service Provider).

The first parking lot 13 and the second parking lot 14 may be any parking lot that services a hospital, airport, mass transmit station, entertainment forum, shopping mall, department store, grocery store or the like. Each of the first parking lot 13 and the fourth parking lot 14 are equipped with detectors (not shown) for detecting the status information for each of the parking lots 13,14. Such detectors may be any type of device capable of ascertaining whether a parking space is occupied or not. The detected status information includes at least the location of vacant parking spaces within the parking lots 13, 14. The status information may, however, include the occupancy status of every parking space within the parking lots 13, 14 or any other information concerning the status of the parking lots 13,14. The first parking lot and second parking lot are also equipped with communication devices (not shown) for communicating the status information to the server 12. Such communications devices may be any type of internal or external device such as a computer, server, application, program capable of conveying the status information to the server 12.

Referring again to Fig. 1, the server 12 is connected to a remote display device 16 through the Internet 15 through the third connection 19 and a fifth connection 21. The fifth connection 21 may be any type of modem, cable, satellite or other type of connection capable of carrying data through the Internet 15 between the server 12 and the remote display device 16.

Fig. 2 illustrates a communication network 100 including a display device 16 communicating with a server 12 through the Internet 15. The server 12 may include one or more server controllers 11 for controlling the server 12. Communication pathway 19 and communication pathway 21 enable wired or wireless communication between the server 12 and the display device 16 through the Internet 15.

The remote display device 16 may be any type computer, computer system, server, settop box or other type of Internet accessible device and may include any type of hardware, software, application or program capable of executing the functions described herein. The remote display device 16 may communicate with the server 12 through the Internet 15 and through wired or wireless communication pathways 19, 21. The display device 16 may include applications that enable textual or graphical display of information, such as an email application or an Internet browser application.

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The display device 16 may include one or more device controllers 160 for controlling the display device 16. An example of device controller 160 is a software application loaded on the display device 16 for commanding and directing communications enabled by the display device 16. Other examples include a

5      program, a piece of code, an instruction, a device, a computer, a computer system, or a combination thereof, for independently or collectively instructing the display device 16 to interact and operate as described herein. The display controller 160 may be embodied permanently or temporarily in any type of machine, component, equipment, storage medium, or propagated signal capable of providing instructions to the client

10    device 16.

In one implementation, the display device 16 is a portable device, such as, for example, a vehicle-mounted device or a hand-held device. The display device 16 includes a general purpose computer 161 having an internal or external storage 162 for storing data and programs such as an operating system 163 (e.g., DOS,

15    Windows™, Windows 95™, Windows 98™, Windows 2000™, Windows NT™, OS/2, or Linux) and one or more application programs. Examples of application programs include authoring applications 164 (e.g., word processing, database programs, spreadsheet programs, or graphics programs) capable of generating documents or other electronic content; client applications 165 capable of

20    communicating with other computer users, accessing various computer resources, and viewing, creating, or otherwise manipulating electronic content; and browser applications 166 (e.g., Netscape's Navigator or Microsoft's Internet Explorer) capable of rendering standard Internet content.

The general-purpose computer 161 also includes a central processing unit 167

25    (CPU) for executing instructions in response to commands from the device controller 160. In one implementation, the device controller 160 includes one or more of the application programs installed on the internal or external storage 162 of the general-purpose computer 161. In another implementation, the device controller 160 includes application programs externally stored in and performed by one or more device(s)

30    external to the general- purpose computer 160.

The general-purpose computer typically will include a communication device 168 for sending and receiving data. One example of the communication device 168 is a modem. Other examples include a transceiver, a set-top box, a communication card, a satellite dish, an antenna, or another network adapter capable of transmitting and

receiving data over wired or wireless data pathway 21. The general-purpose computer 161 also may include a TV ("television") tuner 169 for receiving television programming in the form of broadcast, satellite, and/or cable TV signals. As a result, the display device 16 can selectively and/or simultaneously display Internet content

5    received by communications device 168 and television programming content received by the TV tuner 169.

The general-purpose computer 161 may include an input/output interface 170 for wired or wireless connection to various peripheral devices. Examples of peripheral devices include, but are not limited to, a mouse 171, a mobile phone 172, a

10    personal digital assistant 173 (PDA), a keyboard 174, a display monitor 175 with or without a touch screen input, and/or a TV remote control 176 for receiving information from and rendering information to subscribers.

Although Fig. 2 illustrates devices such as a mobile telephone 172, a PDA 173, and a TV remote control 176 as being peripheral with respect to the general-

15    purpose computer 161, in another implementation, such devices may themselves include the functionality of the general-purpose computer 161 and operate as the display device 16. For example, the mobile phone 172 or the PDA 173 may include computing and networking capabilities and function as a display device 16 by accessing the Internet 15 and communicating with the server 12. Furthermore, the

20    display device 16 may include one, some or all of the components and devices described above.

The operation of one implementation of the present invention will now be described with reference to Fig. 3.

In response to commands from the controller 11, the server 12 retrieves status

25    information from one or more of the parking lots 13, 14 (S10). This may entail the controller 11 commanding the server 12 to poll or query the occupancy status of the parking lots 13, 14 or commanding the server 12 to accept status information periodically sent from the parking lots 13, 14.
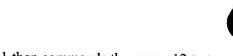
After the server 12 has retrieved the status information, the controller 11

30    instructs the server 12 to perform data processing in order convert the status information into parking lot occupancy data capable of being reproduced by a remote display device 16 (S20). Such data processing may or may not be required depending on the form of the retrieved status information.

The controller 11 then commands the server 12 to transmit the parking lot occupancy data over the Internet 15 (S30). The parking lot occupancy data corresponds to one or more of the parking lots 13, 14 and is capable of being reproduced by a remote display device 16 as a real-time representation of the parking lot 13, 14 indicating vacant parking spaces within the parking lots 13, 14. The real-time representation may be in the form of a textual listing, a graphical map, a video image, an Internet Web page or similar form and may indicate occupied parking spaces as well as reserved parking spaces.

Using a remote display device, a commuter can view the real-time representation of the parking lot and can readily locate an available parking space or decide to search for parking elsewhere.

The operation of another embodiment of the present invention will now be described with reference to Fig. 3. In this embodiment of the present invention, the controller 11 commands the server 12 to accept subscriptions from a plurality of subscribers (S100). The controller 11 commands the server 12 to provide Internet accessibility to parking lot occupancy data corresponding to at least one parking lot for the plurality subscribers (S200). Subscribers may access the real-time representation through the Internet by visiting a Web site or transmitting an email request, for example. The server 12 may provide access for a fee. Accordingly, the controller 11 may command the server 12 to appropriately charge and bill subscribers (S300).

Again, the parking lot occupancy data capable is capable of being reproduced by each of the remote display devices as a real-time representation of the parking lot indicating at least vacant parking spaces within the parking lot. The real-time representation may be in the form of a textual listing, a graphical map, a video image, an Internet Web page or a combination of such forms and may indicate occupied parking spaces as well as reserved parking spaces. Fig. 5 is one example of a graphical user interface that may be displayed to a commuter.

As described above, the present invention will facilitate a commutes search for a parking space by utilizing the capabilities of the Internet to display a real-time representation of available parking spaces within a parking lot.

It should be understood that the embodiments described above are only examples of the present invention and are not intended to limit the scope of the following claims.